

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images,
please do not report the images to the
Image Problem Mailbox.

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

| | | | |
|---|--|---|---|
| (51) International Patent Classification ⁶ : A61K 31/315 | | A1 | (11) International Publication Number: WO 98/17269 |
| | | | (43) International Publication Date: 30 April 1998 (30.04.98) |
| (21) International Application Number: PCT/GB97/02854 | | (81) Designated States: AU, GB, JP, NZ, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). | |
| (22) International Filing Date: 16 October 1997 (16.10.97) | | | |
| (30) Priority Data: 9621630.4 17 October 1996 (17.10.96) GB | | Published With international search report. | |
| (71) Applicant (for all designated States except US): KAPPA PHARMACEUTICALS LIMITED [GB/GB]; Alexander House, Gatchampton Road, Goring-on-Thames, Reading, Berkshire RG8 0EN (GB). | | | |
| (72) Inventor; and | | | |
| (75) Inventor/Applicant (for US only): BRYCE-SMITH, Derek [GB/GB]; Highland Wood House, Mill Lane, Kilmore End, Reading, Berkshire RG4 9HB (GB). | | | |
| (74) Agents: McNEIGHT, David, Leslie et al.; McNeight & Lawrence, Regent House, Heaton Lane, Stockport, Cheshire SK4 1BS (GB). | | | |
| (54) Title: USE OF ZINC SALTS OF CONJUGATED LINOLEIC ACIDS TO TREAT SKIN DISORDERS | | | |
| (57) Abstract | | | |
| <p>The present invention concerns compositions and their use in the treatment of skin disorders, particularly, but not limited to, eczema, psoriasis and dermatitis, and also compositions and their use in treatment of cancer, particularly skin cancer.</p> <p style="text-align: right;"><u>IDS</u></p> <p style="text-align: center;">102(b) 11-13, 15 20-23, 25</p> | | | |
| ATTORNEY DOCKET NUMBER: 3006-044-999 SERIAL NUMBER: To be assigned REFERENCE: AB | | | |

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

| | | | | | | | |
|----|--------------------------|----|--|----|--|----|--------------------------|
| AL | Albania | ES | Spain | LS | Lesotho | SI | Slovenia |
| AM | Armenia | FI | Finland | LT | Lithuania | SK | Slovakia |
| AT | Austria | FR | France | LU | Luxembourg | SN | Senegal |
| AU | Australia | GA | Gabon | LV | Latvia | SZ | Swaziland |
| AZ | Azerbaijan | GB | United Kingdom | MC | Monaco | TD | Chad |
| BA | Bosnia and Herzegovina | GE | Georgia | MD | Republic of Moldova | TG | Togo |
| BB | Barbados | GH | Ghana | MG | Madagascar | TJ | Tajikistan |
| BE | Belgium | GN | Guinea | MK | The former Yugoslav Republic of Macedonia | TM | Turkmenistan |
| BF | Burkina Faso | GR | Greece | | | TR | Turkey |
| BG | Bulgaria | HU | Hungary | ML | Mali | TT | Trinidad and Tobago |
| BJ | Benin | IE | Ireland | MN | Mongolia | UA | Ukraine |
| BR | Brazil | IL | Israel | MR | Mauritania | UG | Uganda |
| BY | Belarus | IS | Iceland | MW | Malawi | US | United States of America |
| CA | Canada | IT | Italy | MX | Mexico | UZ | Uzbekistan |
| CF | Central African Republic | JP | Japan | NE | Niger | VN | Viet Nam |
| CG | Congo | KE | Kenya | NL | Netherlands | YU | Yugoslavia |
| CH | Switzerland | KG | Kyrgyzstan | NO | Norway | ZW | Zimbabwe |
| CI | Côte d'Ivoire | KP | Democratic People's Republic of Korea | NZ | New Zealand | | |
| CM | Cameroon | | | PL | Poland | | |
| CN | China | KR | Republic of Korea | PT | Portugal | | |
| CU | Cuba | KZ | Kazakhstan | RO | Romania | | |
| CZ | Czech Republic | LC | Saint Lucia | RU | Russian Federation | | |
| DE | Germany | LI | Liechtenstein | SD | Sudan | | |
| DK | Denmark | LK | Sri Lanka | SE | Sweden | | |
| EE | Estonia | LR | Liberia | SG | Singapore | | |

- 1 -

USE OF ZINC SALTS OF CONJUGATED LINOLEIC ACIDS TO TREAT SKIN DISORDERS

The present invention concerns compositions and their use in the treatment of skin disorders particularly, but not limited, to eczema, psoriasis and dermatitis, and also compositions and their use in treatment of cancer, particularly skin cancer.

Conjugated linoleic acid and linoleic acid are well-known for their therapeutic, particularly chemotherapeutic, properties (see, for example, Belury, M.A., 1995 Nutrition Reviews, 53 (4) : 83-39 and references therein; Pariza, M.W., Chemistry & Industry, 16 June 1997, 464-466; EP 0 087 863; EP 0 044 341; EP 0 078 434; EP 0 003 407; EP 0 057 175; EP 0 071 357; EP 0 085 579; EP 0 139 480), and have comprised non-essential components of compositions for treating skin disorders (EP 0 727 991). WO 95/13806 discloses the use of a composition comprising zinc salts of 68% (unconjugated) linoleic acid and 10% conjugated isomers of linoleic acid for use in treating skin disorders.

However, the present inventor has now found that zinc salts of conjugated linoleic acids have an unexpectedly great efficacy in the treatment of skin disorders when compared to for example unconjugated zinc linoleate.

According to the present invention, there is provided a composition for use in treating skin disorders comprising substantially the zinc salt of at least one conjugated linoleic acid. The composition may be used in a method of treating skin disorders.

Also provided is the use of a composition comprising substantially the zinc salt of at least one conjugated linoleic acid in the manufacture of a medicament for treating skin disorders.

- 2 -

Also provided is a method of manufacture of a medicament for treating skin disorders comprising the use of a composition comprising substantially the zinc salt of at least one conjugated linoleic acid.

Also provided is a method of treatment of a skin disorder comprising the use of a composition comprising substantially the zinc salt of at least one conjugated linoleic acid.

Methods of manufacture and use of the compositions and medicaments of the present invention will be readily apparent to one skilled in the art and are exemplified in the Examples below.

The composition may comprise at least 50%, for example at least 60%, 70%, 80% or 90%, the zinc salt of at least one conjugated linoleic acid. For example it may substantially comprise the zinc salt of a conjugated linoleic acid or it may comprise a substantially greater proportion of the zinc salt or salts of at least one conjugated linoleic acid than of zinc linoleate

The present inventor has found that the zinc salts of conjugated linoleic acids have a surprisingly great efficacy, compared to that of conjugated linoleic acids alone (which may act as irritants) and of zinc linoleate, when used in the treatment and/or prophylaxis of skin disorders such as eczema, psoriasis, cold sores (herpes) and dermatitis.

The conjugated linoleic acids are a large family of molecules. Dienoic conjugated linoleic acids may be used as the basis of the zinc salts of the present invention. For example, 9,11-octadecadienoic acid or 10,12-octadecadienoic acid may be used. These unsaturated molecules contain double bonds and so there are a number

- 3 -

of geometric isomers of the molecules, for example *cis*9,*trans*11-octadecadienoic acid and *trans*9,*cis*11-octadecadienoic acid.

The compositions of the present invention may be used in conjunction with a pharmaceutically acceptable carrier, diluent or excipient. Such carriers, diluents and excipients are well known - see for example Remington's Pharmaceutical Sciences and US Pharmacopeia (1984) Mack Publishing Company, Easton, PA.

The composition may also comprise at least one antioxidant, for example tocopherol (Vitamin E).

The composition may also comprise for example zinc linoleate and/or the zinc salt of at least one other fatty acid. Conjugated linoleic acids are usually prepared by the isomerisation of linoleic acid, and are therefore liable to contain various residues of linoleic acid. Thus zinc linoleate may be among the zinc salts formed when the isomerised linoleic acid is converted into zinc salts.

The zinc salts of conjugated linoleic acids appear to be more effective than zinc salts of other fatty acids, and (see examples B and C below) do not owe their activity to the presence of zinc alone.

Medicaments and compositions according to the present invention may be administered in doses (i.e. concentrations and quantities) sufficient to effect the desired prophylactic or therapeutic result. Such doses may be readily determined using simple dose-response experiments.

The doses may be such that they are substantially non-irritant to the patient.

- 4 -

According to a further aspect of the present invention, there is provided a composition for use in treating cancer comprising substantially the zinc salt of at least one conjugated linoleic acid. The composition may be used in a method of treating cancer.

Also provided is the use of a composition comprising substantially the zinc salt of at least one conjugated linoleic acid in the manufacture of a medicament for treating cancer.

Also provided is a method of manufacture of a medicament for treating cancer comprising the use of a composition comprising substantially the zinc salt of at least one conjugated linoleic acid.

Also provided is a method of treatment of a cancer comprising the use of a composition comprising substantially the zinc salt of at least one conjugated linoleic acid.

Methods of manufacture and use of the compositions and medicaments of the present invention will be readily apparent to one skilled in the art, particularly with reference to the Examples below.

The composition may comprise at least 50%, for example at least 60%, 70%, 80% or 90%, the zinc salt of at least one conjugated linoleic acid. For example it may substantially comprise the zinc salt of a conjugated linoleic acid or it may comprise a substantially greater proportion of the zinc salt or salts of at least one conjugated linoleic acid than of zinc linoleate.

A zinc salt may for example be of 9,11-octadecadienoic acid or 10,12-octadecadienoic acid.

- 5 -

The zinc salts of the compositions of the present invention for the treatment and/or prophylaxis of skin disorders also appear to be useful in the treatment and/or prophylaxis of cancer, particularly epidermal cancers such as skin cancer.

The medicament may additionally comprising a pharmaceutically acceptable carrier, diluent or excipient.

The invention will be further apparent from the following description and examples which show, by way of example only, zinc salts of conjugated linoleic acids for use in the treatment of skin disorders.

Example A

Preparation of zinc conjugated linoleates (ZCL) in a formulation suitable for topical application.

215g of Pamolyn (RTM) 380 (Hercules Inc., Hercules Plaza, Wilmington, DE 19894, USA) containing ca. 69% of conjugated linoleic acids was heated to 70°C with 500g Emulsifying Ointment BP: 32.5g of zinc oxide was added slowly with stirring. Heating was continued for a further 5 minutes, then 1,250ml of boiling demineralised water was slowly added with stirring. The whole hot product was then emulsified by vigorous mechanical agitation and allowed to cool, giving a white semi-cream which when cool was well absorbed on topical application to the skin with gentle rubbing.

The physical characteristics of the product were varied by increasing or decreasing the proportion of water during the preparation. One half of the above proportion of water gave an ointment, whereas increasing the proportion of water by 50% gave a cream.

Example B

- 6 -

A male patient suffering from eczema, mainly on the arms, was treated by daily topical application of the ZCL semi-cream of Example A. The condition was completely cured within 4 days.

Example C

Previous treatment as in Example B with a product similar to that of Example A but containing only one-seventh of the proportion of ZCL, but the same proportion of zinc, had improved the eczema to a limited extent but had not provided a complete cure even after application over 2 weeks.

Example D

The product prepared as in Example A was used to treat a female patient suffering from facial psoriasis. This condition was greatly improved within 1 day and essentially cured within 2 days.

Example E

A male patient aged 70 years suffering from pruritus of the legs and scalp was treated by topical application of a semi-cream prepared as in Example A. Itching ceased within 10-15 minutes.

Example F

A male patient aged 55 years experienced severe sunburn. A single application of the semi-cream of Example A rapidly removed all soreness and discomfort.

Example G

A female patient of 55 years age suffered severe discomfort caused by pressure sores on the trunk. A single application of the semi-cream of Example A rapidly alleviated all soreness and discomfort.

Example H

A male patient of 55 years age suffered from an erupted (i.e. broken skin) cold sore (Herpes). Treatment with the semi-cream of Example A rapidly removed the soreness and discomfort, and the condition was essentially cured within 2 days.

Example I

A male patient suffering from skin cancer applied the semi-cream of Example A on a daily basis to an area of skin cancer. Over a period of four months, the appearance of the affected area improved (although the cancer did not totally disappear) and itching of the affected area stopped. Discontinuation of treatment resulted in the recurrence of itching at the affected area.

Example J

A female patient had a patch of discoloured skin on one ankle which was medically diagnosed as skin cancer. Application to the affected area of the semi-cream of Example A completely stopped unpleasant itching felt at the affected area. Continued use over a period of about six months resulted in the patch of cancerous skin becoming much less raw in appearance and it started to break up into islets separated by skin of more normal appearance.

- 8 -

CLAIMS

1. A composition for use in treating skin disorders comprising substantially the zinc salt of at least one conjugated linoleic acid.
2. A composition according to claim 1 used in a method of treating skin disorders.
3. The use of a composition comprising substantially the zinc salt of at least one conjugated linoleic acid in the manufacture of a medicament for treating skin disorders.
4. A method of manufacture of a medicament for treating skin disorders comprising the use of a composition comprising substantially the zinc salt of at least one conjugated linoleic acid.
5. A method of treatment of a skin disorder comprising the use of a composition comprising substantially the zinc salt of at least one conjugated linoleic acid.
6. A composition or method according to any one of the preceding claims, the composition comprising at least 50% the zinc salt of at least one conjugated linoleic acid.
7. A composition or method according to claim 6, the composition comprising at least 60%, 70%, 80%, or 90% the zinc salt of at least one conjugated linoleic acid.
8. A composition or method according to any one of the preceding claims, a conjugated linoleic acid being selected from the group of 9,11-octadecadienoic acid and 10,12-octadecadienoic acid.

- 9 -

9. A composition or method according to any one of the preceding claims, the skin disorder being selected from any one of the group of eczema, psoriasis, cold sores and dermatitis.
10. A composition for use in treating cancer comprising substantially the zinc salt of at least one conjugated linoleic acid.
11. A composition according to claim 10 used in a method of treating cancer.
12. The use of a composition comprising substantially the zinc salt of at least one conjugated linoleic acid in the manufacture of a medicament for treating cancer.
13. A method of manufacture of a medicament for treating cancer comprising the use of a composition comprising substantially the zinc salt of at least one conjugated linoleic acid.
14. A method of treatment of a cancer comprising the use of a composition comprising substantially the zinc salt of at least one conjugated linoleic acid.
15. A composition or method according to any one of claims 10-14, the composition comprising at least 50% the zinc salt of at least one conjugated linoleic acid.
16. A composition or method according to claim 15, the composition comprising at least 60%, 70%, 80%, or 90% the zinc salt of at least one conjugated linoleic acid.
17. A composition or method according to any one of claims 10-16, a conjugated linoleic acid being selected from the group of 9,11-octadecadienoic acid and 10,12 octadecadienoic acid.

- 10 -

18. A composition or method according to any one of the preceding claims, the cancer being skin cancer.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 97/02854

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A61K31/315

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| A | WO 95 13806 A (KAPPA PHARMACEUTICALS) 26 May 1995 cited in the application --- | |
| A | P.W.PARODI: "Conjugated linoleic acid: an anticarcinogenic fatty acid present in milk fat." AUSTRALIAN J. DIET. TECHNOL., vol. 49, no. 2, 1994, pages 93-97, XP002053008 --- | |
| A | M.A. BELURY ET AL.: "Dietary conjugated linoleic acid modulation of phorbol ester skin tumor promotion." NUTR. CANCER, vol. 26, no. 2, 1996, pages 149-157, XP002053009 --- | |
| -/-- | | |



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

22 January 1998

Date of mailing of the international search report

06/02/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Klaver, T

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 97/02854

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| A | <p> DATABASE WPI Week 9507 Derwent Publications Ltd., London, GB; AN 95-044024 XP002053010 & CZ 9 300 924 A (STOL) , 15 December 1994 see abstract ----- </p> | |

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. .tional Application No

PCT/GB 97/02854

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|------------------------------|----------------------|
| WO 9513806 A | 26-05-95 | EP 0727991 A JP 9505073 T | 28-08-96 20-05-97 |
| ----- | | | |